Gas Analyzer 810-830

Operating manual

Gas Analyzer 810-830

Operating Manual
(ENGLISH)

Rev. 1.3

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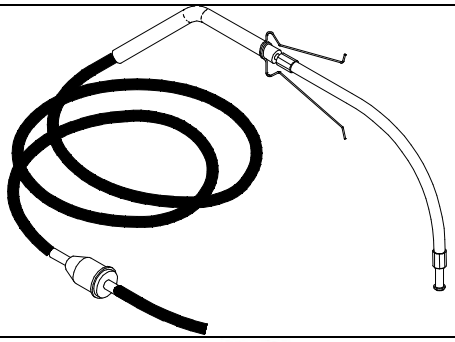
1 Foreword

Dear Customer,

Thank you for having given us your preference in selecting our product. We think it can bring you the utmost satisfaction during use. For correct use, please carefully read the instructions included in this user's manual, store it with care and consult it whenever necessary.
The system is based on the concept of modularity, it can thus be customised and drawn on user's real needs.
Our exhaust gas analysers are specially suitable for the most demanding users as for performance and versatility of vehicles emissions analysis.
Thanks to the appealing line characterising the whole range, our products are the new reference point for the analysis of pollutant emission. All testers are manufactured in compliance with the most selective quality criteria.

This manual describes the gas analyser 810 used for the polluting emissions of gasoline vehicles.
This manual describes the use of the device inside a workshop for the certified check-up ("Blue Tag" for the Italian regulations) and in a MCTC-NET testing line.

2 Package Contents

Gas analyser 810-830	
220V supply cable.	
Serial cable for connection to the PC.	
Exhaust gas sampling probe.	
CD with the “Exhaust Analysis System” software and the Router software, with relevant user’s manuals.	
Instrument logbook.	

3 WARRANTY

Warranty terms and conditions are defined as follows, unless otherwise specified in the order confirmation:

3.1 Warranty Scope

TECNOMOTOR ensures the good quality and construction of its machines; it undertakes, during the warranty specified period, to repair or replace for free the parts whose failure or early wear are due to bad quality of the used materials, manufacturing faults or defective assembling.

The warranty does not cover those parts whose failure or wear are due to:

- Failure to comply with the instructions contained in the Use and Maintenance Manual.
- No maintenance service or incorrect maintenance.
- User negligence in checking levels, filter cleaning, auxiliary services, and power supply.
- The use of unsuitable tools for ordinary and extraordinary maintenance.
- Changes and/or tampering carried out by the user or third parties without previous approval of TECNOMOTOR.
- The use of non-original spare parts.

3.2 Warranty Period

The warranty period is **12 MONTHS** beginning from the delivery date.
This term is definitive and is not subject to extensions even in case of replacements or repairs during such period.

3.3 Warranty Application

To determine the causes and apply the warranty, it is necessary to send the parts you want to be replaced under warranty to TECNOMOTOR or to authorised service centres.

TECNOMOTOR will decide whether to carry out repairs or replacements under warranty in-house, by third parties, or on site.
As far as the on site services are concerned, the customer shall provide the power supply, the extraordinary equipment, the auxiliary personnel, as well as bear the costs for travel, board and lodging of the TECNOMOTOR staff.

3.4 Material Return

Before sending to TECNOMOTOR the parts you request to be replaced or repaired under warranty, it is necessary to transmit all information to the Service Department for its approval. All parts shall be suitably packed in order to avoid any damage due to the transport, and shall be supplied with a document specifying:

- *machine serial number;*
- *part number;*
- *detailed description of the fault and how it occurred.*

The parts under warranty are delivered ex-works; the replaced parts will be of TECNOMOTOR property and shall be returned ex-works.

3.5 Exclusions and Limitations

- **The warranty does not cover materials and parts subject to normal wear such as connection cables, parts and accessories outside the device, etc.**

4 Tester Description

Tester 810 is an analyser used to measure the quantity of pollutants inside vehicles exhaust gases.
To measure carbon monoxide (CO), carbon dioxide (CO2) and unburned hydrocarbons (HC) concentration, a reading cell applying the NDIR (Non Dispersive Infra Red) technology is used. Oxygen (O_2) and nitrogen oxide (optional) are measured by means of electrochemical cells.
Gas analyser mod.810 features the following functions:

- Vehicles exhaust gas analysis
- Engine rpm reading.
- Engine oil temperature reading

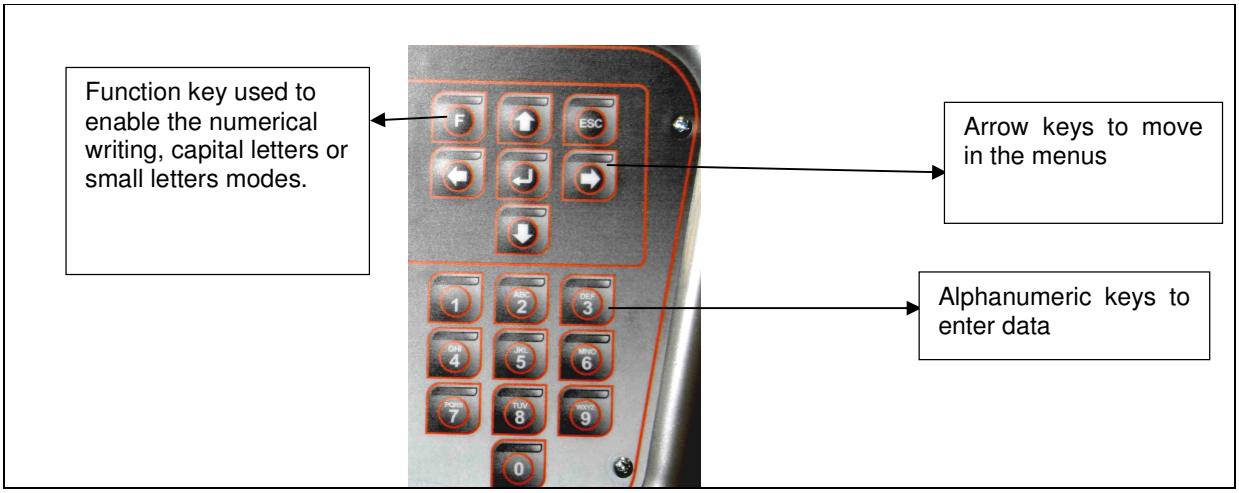
Test reports can be printed out on a coupon thanks via a printer positioned on instrument control panel.
If you wish to use instrument on an MCTCNET testing line, refer to the section relating to PC side software set-up.
Tester can be equipped with a battery-operated serial rev counter allowing to detect engine rpm by connecting sensor to vehicle battery.

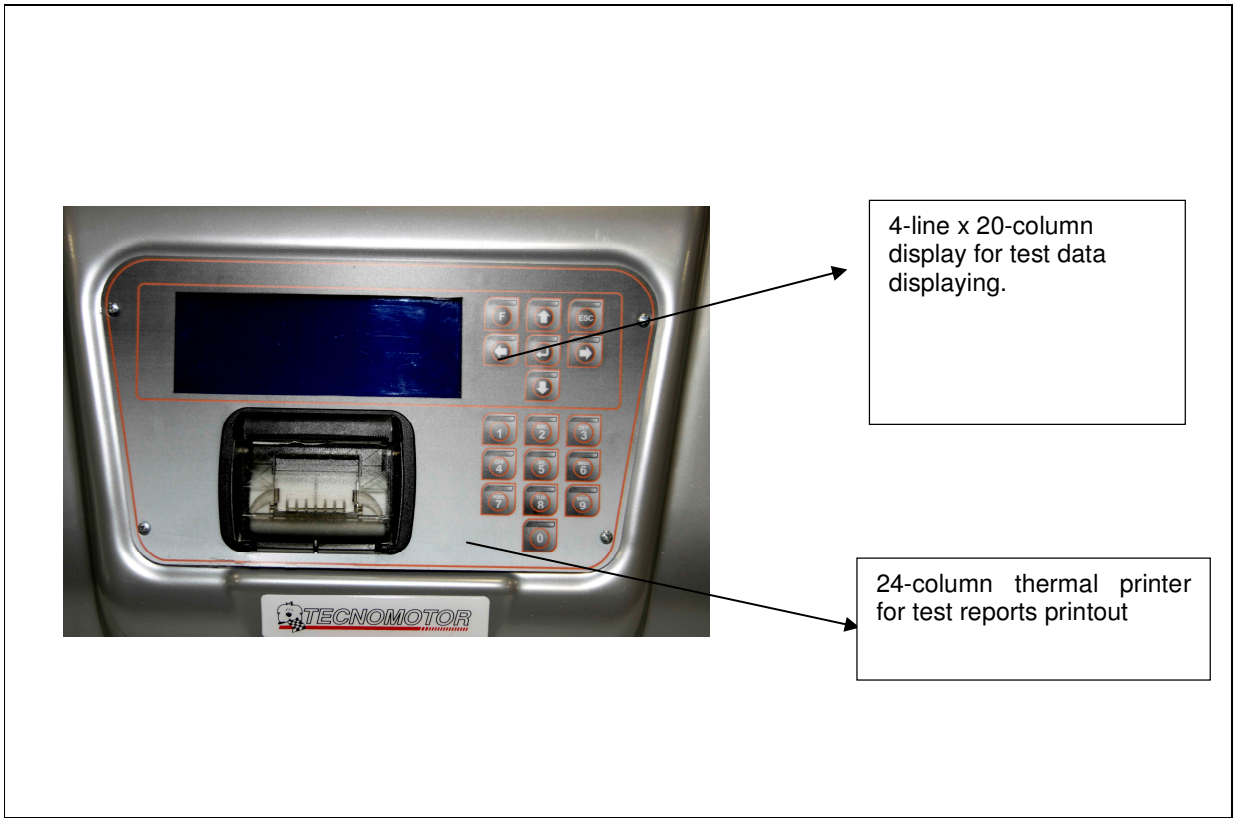
4.1 Reference Standards

The analyser has been manufactured to comply with the Ministerial Decree 628 dtd 23rd October 1996 and circular letter 88/95 dtd 6th September 1999, as well as with the circular letter prot. No. 6247/698/99 dtd 16/11/99, and following changes and integration.
It has been manufactured also in compliance with the provisions of OIML R99, Edition 2000 (Class 0), and ISO 3930 edition 2000 International Standard.
Gas analyser 810 can be integrated in a M.C.T.C.NET testing line.

4.2 Main Elements

Gas analyser is equipped with an alphanumeric display, with 4 lines having 20 digits each. An alphanumeric keypad and special function keys allow the operator to move quickly among the different menus offered by the tester.


Function key used to enable the numerical writing, capital letters or small letters modes.
Arrow keys to move in the menus
Alphanumeric keys to enter data



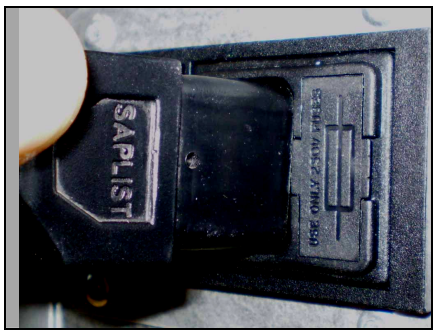
5 Product Installation

At first, remove analyser from package, and connect the supplied power cable to the gas analyser.

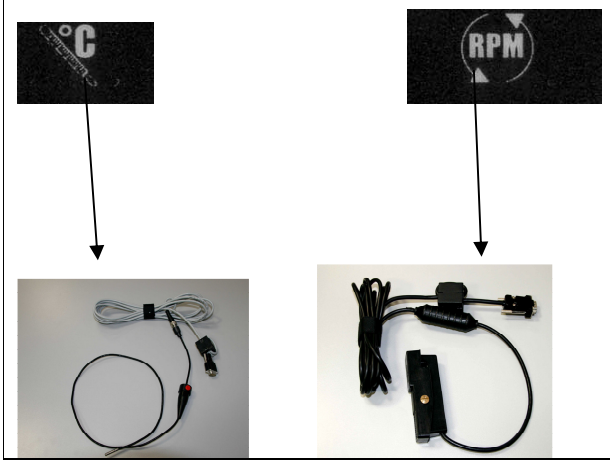
5.1 Power Supply

The device shall be powered through the power cable supplied with the package.

Insert the supply cable in the outlet placed in the tester rear side, as shown in the picture below.



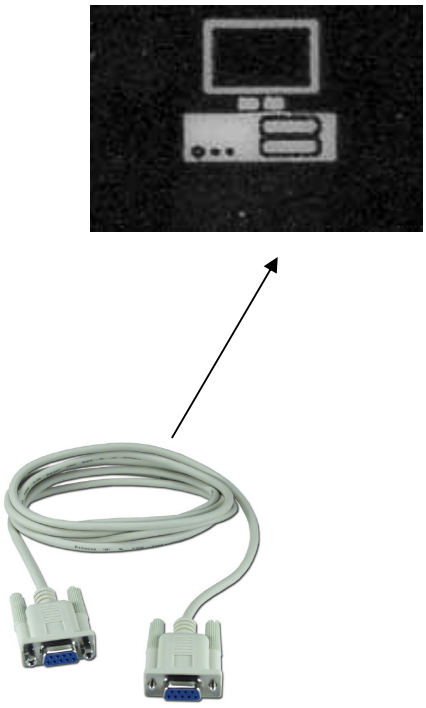
5.2 Connect Heat Probe and Rpm Detector



Special inputs for probes connection are located on tester back side.

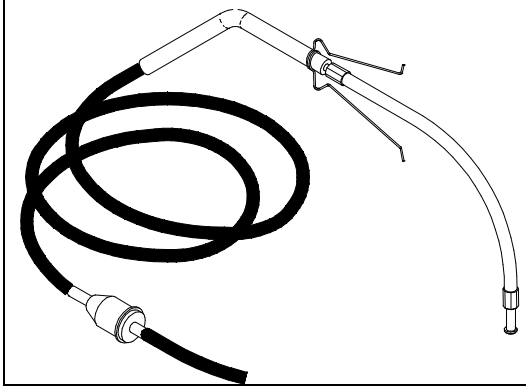
In particular, the cup connector marked with "°C" will have to be used to connect heat probe, while connector marked with "RPM" will have to be used to connect inductive clamps rev counter.

5.3 PC Connection

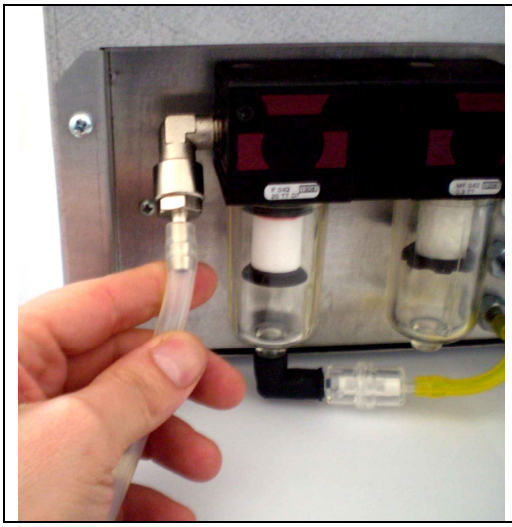


A special 9-pole cup socket marked with the PC symbol is positioned on tester back side. This is the connector to be used to connect and communicate with PC. Connect the serial cable coming with the tester to this input.

5.4 Gas Probe Connection

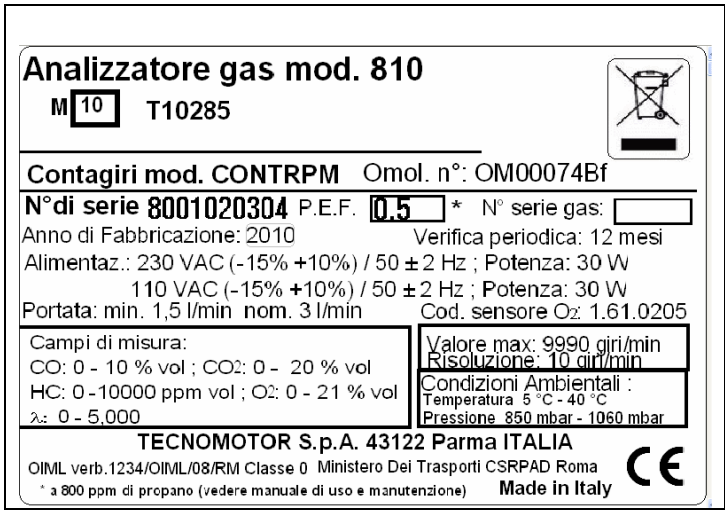


The gas probe features a metallic nozzle collecting the gases, and shall be inserted in the vehicle exhaust pipe, whereas the other side shall be connected to the analyser.

	The instrument gas inlet is situated on the condensate separator. Connect the gas sampling probe as shown in picture.

5.5 Identification Label

The identification label on the analysis module contains data relevant to year of production, serial number, approval number, besides manufacturer name and instrument model.


Analizzatore gas mod. 810
M 10 T10285
Contagiri mod. CONTRPM Omol. n°: OM00074Bf
N°di serie 8001020304 P.E.F. 0.5 * N° serie gas:
Anno di Fabbricazione: 2010 Verifica periodica: 12 mesi
Alimentaz.: 230 VAC (-15% +10%) / 50 ± 2 Hz ; Potenza: 30 W
110 VAC (-15% +10%) / 50 ± 2 Hz ; Potenza: 30 W
Portata: min. 1,5 l/min nom. 3 l/min Cod. sensore O2: 1.61.0205
Campi di misura:
CO: 0 - 10 % vol ; CO2: 0 - 20 % vol
HC: 0 -10000 ppm vol ; O2: 0 - 21 % vol
λ: 0 - 5.000
Valore max: 9990 giri/min
Risoluzione: 10 giri/min
Condizioni Ambientali :
Temperatura 5 °C - 40 °C
Pressione 850 mbar - 1060 mbar
TECNOMOTOR S.p.A. 43122 Parma ITALIA
OIML verb.1234/OIML/08/RM Classe 0 Ministero Dei Trasporti CSRPAD Roma
* a 800 ppm di propano (vedere manuale di uso e manutenzione)
Made in Italy
CE

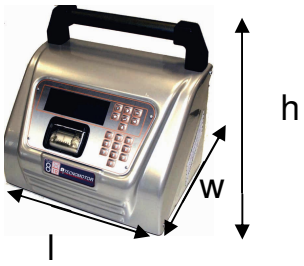
It also provides specific technical data of the measurement system, as required by the Standards in force.

A copy of the instrument original identification label shall be applied in the space below. The user shall always refer to the identification data on this label every time he/she needs information.

COPY OF THE
IDENTIFICATION LABEL
OF GAS ANALYSER 810

The label placed on the analyser rear side.

5.6 Technical Specifications



Tester dimensions:

H = 33 cm
L = 34 cm
W = 22.5 cm

Power supply	• 220/110V -50/60 Hz. • 12V
Absorbed power	30 W at 12 V
Operating temperature	5°C....40°C
Relative humidity	0 .... 95 %
Measurement fields	CO = 0 - 9.99 % vol. $C0_2$ = 0 - 19.9% vol. HC = 0- 10,000 ppm vol. 0_2 = 0 - 25 % vol.
Resolution	CO - 0.01 % vol. $C0_2$ - 0.1 % vol. HC - 1 ppm vol. O_2 - 0.01 % vol.
Weight	6.2 Kg

6 GENERAL INSTRUCTIONS

Gas analyser 810 acquired the OIML Class 0 homologation and the Italian Conformity Homologation with Ministerial Decree 628/96 dtd October 23rd 1996.

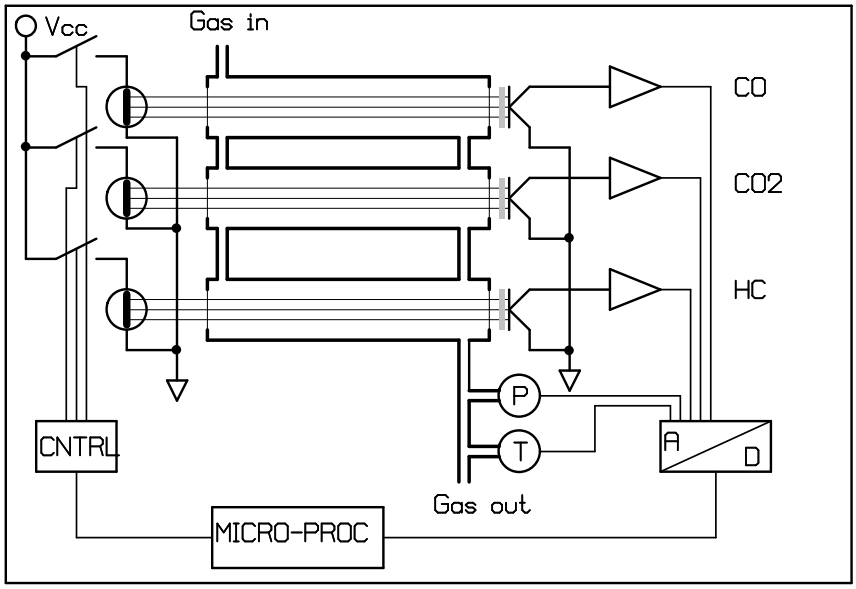
6.1 Operating Principle

Microbench II cell is based on the NDIR (**N**on **D**ispersive **I**nfra **R**ed) technology.
It has been developed and manufactured to be a small-size module complying with OIML R99 Class 0 requirements and with ISO3930 technical specifications. The new technology used to minimise size and power consumption did not reduce cell efficiency, but on the contrary it increased it by allowing the reading of 5 gases. Besides the 3 common gases (CO, CO2 and HC), thanks to special sensors – directly connected and managed by the cell – also Oxygen (O2) and Nitrogen Oxides (NOx) can be analysed.
Cell size is so compact thanks to the elimination of all moving parts, such as all those mechanical systems used so far to interrupt the infrared beam. The development of this new technology allowed the manufacturing of an extremely compact measuring bench with the first advantage being the reduced sensitivity to mechanical shocks.
The measurement of the gases analysed by Microbench with NDIR system is carried out by selecting a special infrared wavelength for each gas where it is known there is max. absorption and no other gas has important absorption.
Special filters positioned before the receiver allow the passage of the wavelengths absorbed by the gas to be measured, only. When the sampling cell contains the gas to be sampled, the receiver measures the reduction of the infrared energy transmitted for the wavelength of each single gas.
The electronic process determines the i/i0 difference, namely the absorption degree, where the reference start signal is i0, while i is the signal resulting after passage inside the measuring cell.

The measuring chamber consists of a single aluminium block housing the three measuring cells for CO, CO2 and HC. The HC cell, unlike the other

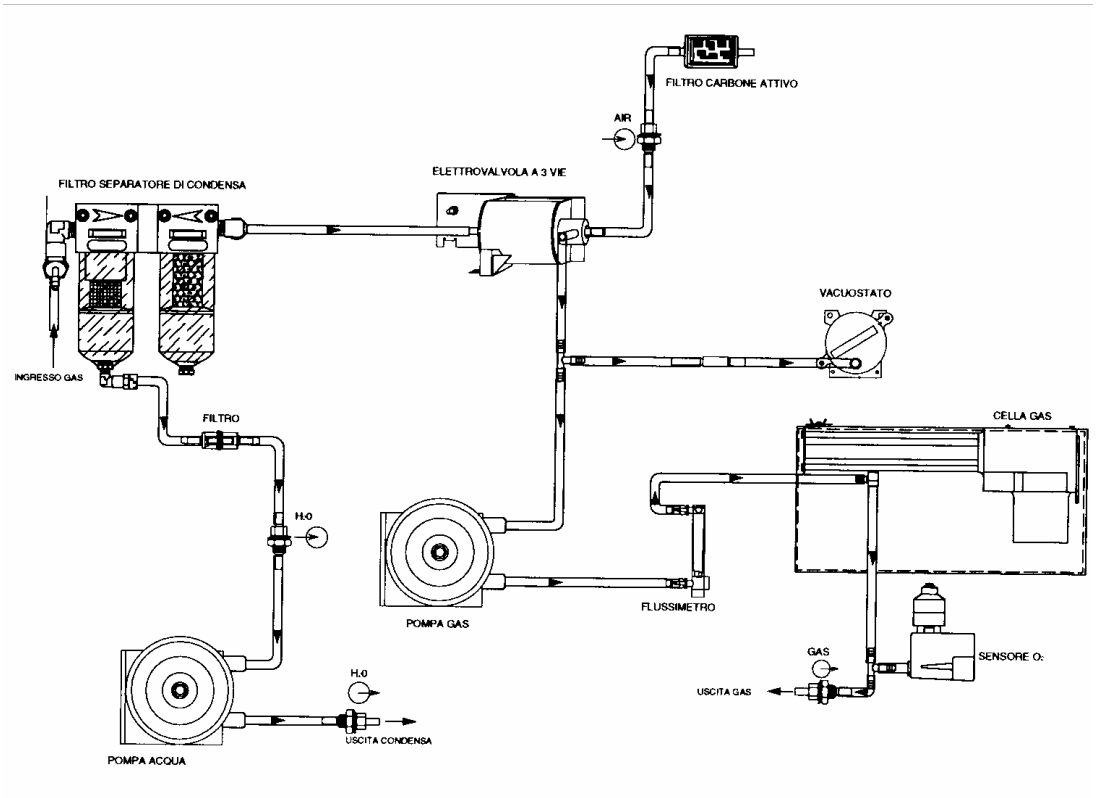
ones, also contains a reference cell to make HC reading more consistent, and to give a greater accuracy level to the whole block.

6.2 Microbench Principle System



6.3 Intake Circuit Diagram

The diagram below reproduces the correct exhaust gases intake and



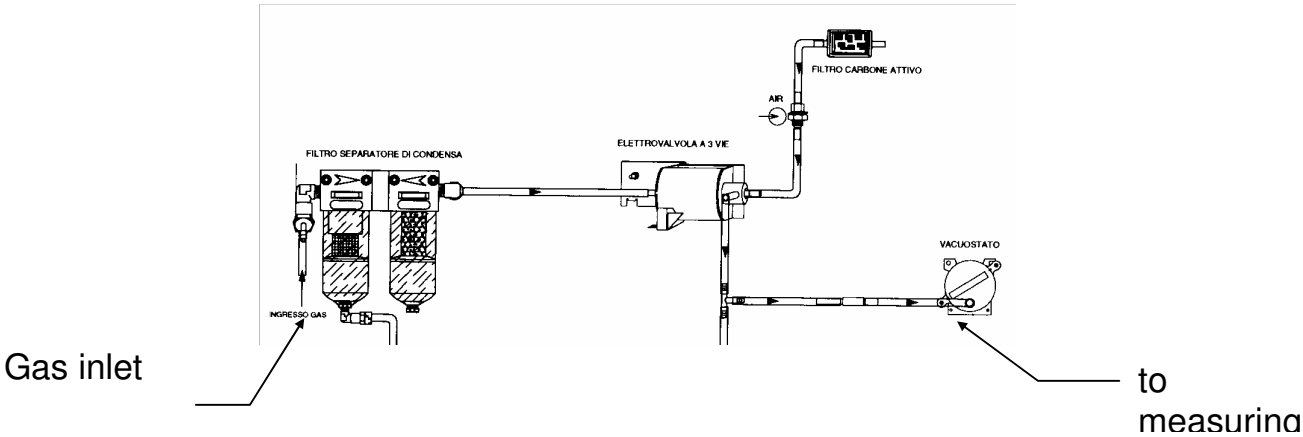
condensate ejection system adopted inside gas analyser mod. 810.

A special device detecting when the gas flow drops under the min. allowed value and sending and electric signal to the feeder board then transmitting it again to the measuring cell is inserted inside the intake circuit. Here, the signal is detected by analyser management software locking gas measurement.
A check is carried out also to detect any sealing fault. In this case the system is automatic, and completely managed by the software with the only manual action to close gases inlet, when required by the procedure.

6.4 Gas Inlet

Gases entering the measuring chamber pass through an outer filtering system so as to ensure the total elimination of any dirt and water vapour together with suspended particles having a size greater than 4um from gas.
Then gas reaches a solenoid valve used to close gas access to the measuring cell, and to allow room air inlet during autozero procedure.

6.5 Gas Inlet Management Diagram



7 MAINTENANCE SERVICE

This chapter contains all information necessary to keep your device in perfect conditions.
To carry out an excellent maintenance service, it is essential to carefully read and, in case of need, consult this manual section. This will ensure a correct maintenance service and, consequently, a device trouble-free operation and a longer life.

WARNING: Before carrying out any maintenance operation, make sure that the power supply is off. Wait for the power to be off before touching any electric part.

WARNING: Staff unaware of the instructions herein (that shall nevertheless be spread as widely as possible) shall not be allowed to use, work on internal parts of the tester and to carry out maintenance services.

WARNING: Do not use tools or other material that are not suitable for repairs.

Upon each reading completion:

1) **Carry out** a quick visual check of filtering system so as to exclude any accidental or unexpected damage. For a more detailed periodical check, refer to “Filtering System Cleaning” under the “Maintenance” section of this manual.
2) **Make sure** that no exhaust gases are left inside the tester, by making this latter operate in free reading page mode with the probe outside the exhaust pipe.
3) At the end of each working day, **disconnect** probe from inlet filter (fabrics filter) and use a jet of compressed air to blow inside the black pipe on filter insertion side so as to eliminate any condensate or soot deposited inside the sampling probe pipe

7.1 Cleaning

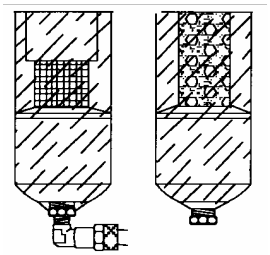
Warning: do not carry out any cleaning operation when the instrument is working.

Proceed as follows to clean the instrument:

Make sure that the multiple outlet switch is **OFF**.

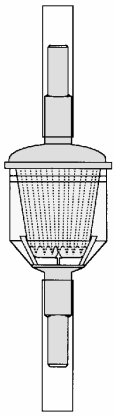
Remove dust with a cloth soaked in alcohol.

WARNING: Do not clean the inside part of the condensate separator chambers with alcohol.



7.2 Daily Maintenance.

Check the filter (see picture below) placed on the sampling probe and change if the filtering side gets continuously dirty (part number FILTROGAS-01).



7.3 Weekly Maintenance

Carry out ordinary maintenance operations on the filtering system as described in “Filtering System Cleaning".

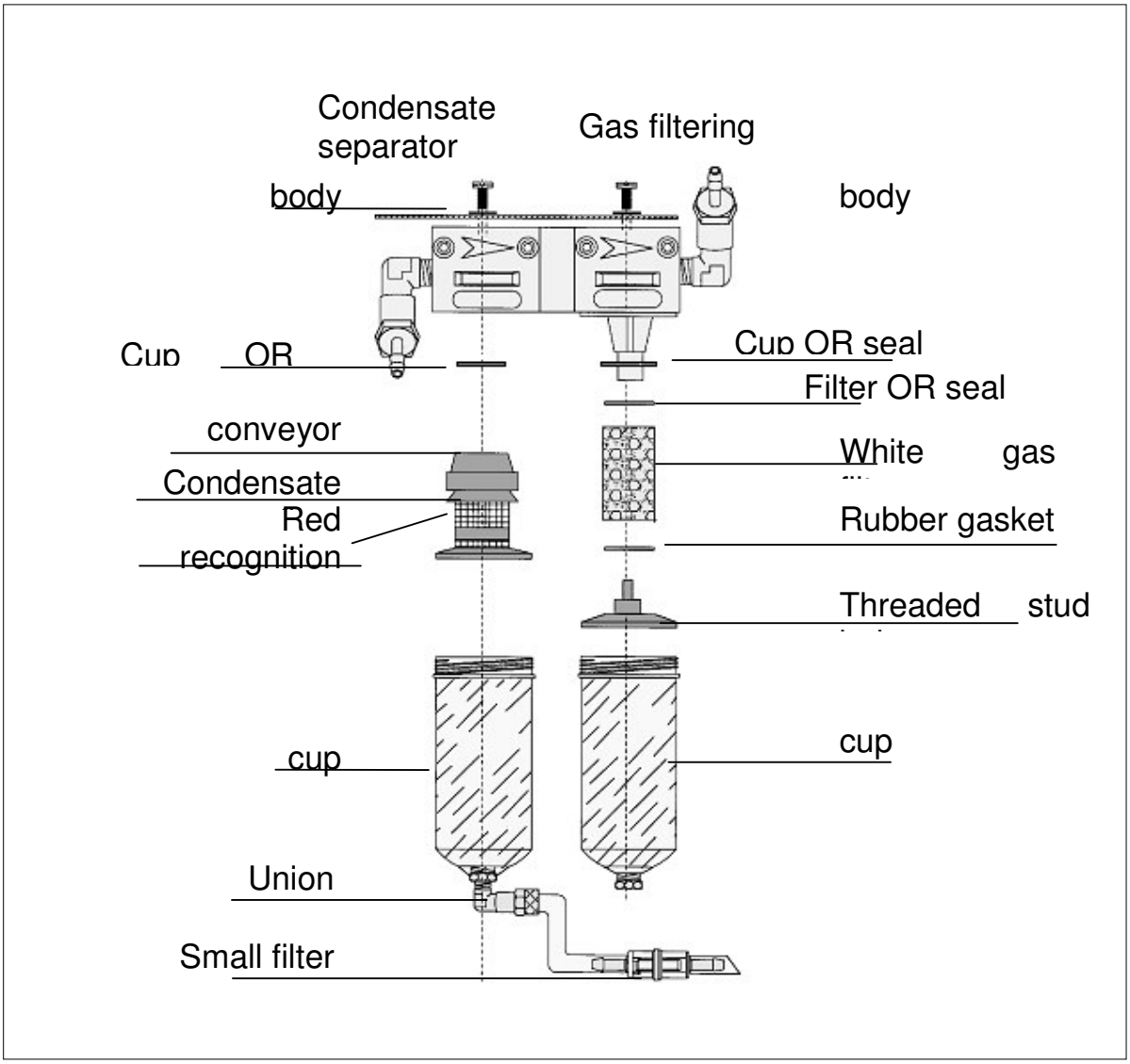
7.4 Six-Month Maintenance

This six-month maintenance consists in the:

* Complete check of the gas main system, from condensate drain until probe (filter included).
* Check of accessories wholeness

7.5 Filtering System Cleaning

The filters positioned on tester rear side have a very Important function as they protect the delicate inner mechanisms from outside foreign bodies and impurities. Their proper cleaning is thus essential.



Warning:

1) Make sure that the 2 cup OR seals are always present
2) The “white Gas filter” gets dirty from the inside to the outside
3) The “Conveyor”-“condensate filter” assy is pressure-fitted onto condensate separator body

7.6 CONDENSATE FILTER CLEANING

- **Disconnect** transparent pipe from union, and change small filter in case it is blackened.
- **Loosen** cup anticlockwise taking care that the **OR** seal does not come out of the body.
- **Slide out** the whole condensate filter from below.
- **Dip** the filter block inside a solution of hot water and detergent (not solvent-based) for a few minutes, then dry it.
- **Clean** cup with compressed air (**DO NOT USE ALCOHOL**) or with a cloth to dry any condensate residues.
- **Refit** filter block.
- **Screw** cup again with the utmost care.

7.7 CHANGING GAS FILTER

Change this part only if the filter has become grey.

- **Loosen** cup anticlockwise taking care that the **OR** seal does not come out of the body.
- **Loosen** threaded stud bolt by hand or using a 6mm hex. wrench, and remove **Gas filter**.
- **Fit** a new filter, taking care that the two rubber gaskets are always placed in-between.

7.8 CHANGING ACTIVATED CARBON FILTER

Filter is used to purify air in order to remove any dust or unburned hydrocarbons (HC) from cell.
Activated carbon filter (Part No.FILTER-Ø2)
The duration of this filter depends on the air HC content.
Analyser has better to be positioned far from fuel or solvent containers.
Whenever the analyser detects a negative concentration of HC (- 5 / -10 HC ppm) during the HC testing phase, change the activated carbon filter.
Under tester optimal conditions, this filter will have to be changed once a year.
To change filter, proceed as follows:

- Disconnect pipe between filter and air inlet
- Slide filter out of its seat
- Change filter and connect air outlet pipe

7.9 Checking and Cleaning the Inductive clamps

This operation is very simple:

- **Loosen** brass adjuster, and open clamps,
- **Then** clean the two inner ferrite elements so as to allow a perfect contact with each other.
- During this operation, check if some ferrite parts are damaged. If this should be the case, do not try to glue the broken pieces as the part operation would be seriously affected, but ask for the new spare part RC501-DB.

7.10 CHANGING OXYGEN SENSOR

For tester correct operation, the electrochemical sensor positioned inside instrument shall be changed whenever the CHANGE OXYGEN SENSOR message is displayed on the monitor.

Sensor replacement shall be considered as an annual ordinary maintenance procedure, and will have to be carried out by authorised personnel to prevent any damage to the instrument.

Technical service centres and Tecnomotor change oxygen sensor both during periodical checks and in case of any sensor malfunction.

7.11 GAS CALIBRATION

Gas analyzers instruments, need to be periodically calibrated by a Tecnomotor authorized service center or third parts authorized.
The Gas Calibration procedure is performed using sample gas bottle which allows at the measurements carried out from the instrument, to respect the right accuracy requested by the norm.

The interval time for instrument type 810 and 830 for gas calibration is 12 months.

WARNING: Oxygen sensor reaches its max. nominal voltage approx. 24 hours after having been taken out from its hermetic package. It is nevertheless enough to remove it from the package at least 1 hour before installation.

Important: Oxygen sensor has a limited lifetime: it can be compared to a common electrochemical battery, and it thus features a natural discharge.

The duration is of about **12 - 15 MONTHS** FROM TESTER MANUFACTURING DATE; tester use or inactivity **DO NOT VARY** sensor lifetime. Oxygen sensors discharge when they come into contact with atmospherical oxygen. Spare sensors are supplied inside a plastic package that does not contain oxygen, so they do not start discharge until they are removed from such a package.

8 Using the Instrument

8.1 Switching ON/OFF

After having followed the indications for product installation, you can now turn the analyser on.
To turn the device on, turn switch positioned on tester back side close to power connector (see figure below) to “ON".

8.2 Using the Keys

Data are entered using the keypad. Based on the needs, you can enter numerical or letter values.
To switch from <123> numerical values setting to letter values with small letters <abc> and capital letters <ABC>, press F.

<123>	F→	<abc>	F→	<abc>	F→	<123>

If you are entering values that can have one format only, it will not be possible to change the type of data (for example, date has just a numerical value and no letters can be entered).

8.3 Commissioning upon First Start-Up

Analyser shall be activated upon first start-up by entering the activation code present inside package.

8.4 Analyser Configuration

When some set-up changes are required (such as time and date adjustment) and whenever a change of the configuration being used (such as the shift from the inductive clamps rev counter to the M.C.T.C.NET rev counter) is necessary, access the set-up menu.
Turn ANALYSER on pressing key in par. 8.1.

Upon switching on, a short introduction page followed by the available functions will be displayed.
To access the set-up menu, press function key (F) while the tester is being turned on, or press ESC twice when the tester is already in the main menu for test type selection.

Select the Set-up item and press the key (↵) to confirm.	►Set-up Service
Select the desired item and press the key (↵) to confirm.	Rev counter Time and Date ►Workshop data …
Press ESC to quit the Setup menu.	

8.4.1 Selecting the Rev Counter

Press ESC during the starting page.

Select the Set-up item and press the key (↵) to confirm.	►Set-up Service
Select the Rev Counter item and press the key (↵) to confirm.	►Rev counter Time and Date Workshop data …
Select the rev counter “Type”. It can be the “Inner” one of the instrument (for instruments with integrated rev counter), and outside complying with the MCTC-Net communication protocol, or outside of the Stand Alone type. When a Stand Alone rev counter is used, the software will require to manually enter the reading before the end of an official testing.	►Inner MCTC-NET Stand Alone

8.4.2 Time and Date Set-up

Press ESC during the starting page, or press function key F, or press ESC twice from tester main menu.

Select the Set-up item and press the key (↵) to confirm.	►Set-up Service
Select the "Time and Date" item and press the key (↵) to confirm.	Rev counter ► Time and Date Workshop data …
Select the "Time" item and press the confirmation key (↵) to change the time.	►Time Date
Enter time in the hh mm ss format. Press (↵) to confirm or ESC to abort the operation.	Time 16.29.31 hh mm ss
To edit date, select “Date”, and press (↵) to confirm	Time ►Date

Enter date in the dd mm yyyy format. Press (↵) to confirm or ESC to abort the operation.	Date 30/05/2005 dd mm yyyy

8.4.3 Workshop Data Set-up

Press ESC during the starting page.

Select the Set-up item and press the key (↵) to confirm.	►Set-up Service
Select the "Workshop data" item and press the key (↵) to confirm.	Rev counter Time and Date ►Workshop data …
Select the workshop relevant items and press the key (↵) to confirm them.	►Workshop name Address City …

8.4.4 Standby Time Set Up

The standby function is used to protect the most delicate parts of exhaust gas analyser. When analyser keys are not pressed for a set time, system will automatically enter the standby mode thus preventing parts useless wear and reducing consumption levels.
The time, expressed in minutes, after which system enters the standby mode, is set as follows:

Select the Set-up item and press the key (↵) to confirm.	►Set-up Service
Select the "Standby Time" item and press the key (↵) to confirm.	Time and Date Workshop data ►Standby Time (m)

8.5 Service

These functions are accessed when measuring modules setting has to be checked. Some functions have to be carried out only by technical service centres and are password-protected.

8.5.1 Gas Analyser Parameters and Data Check

Press ESC or F during starting page.

Select the Service item and press the key (↵) to confirm.	Setup ►Service
Select the "Gas Analyser" item and press the key (↵) to confirm.	►Gas Analyser Rev counter …
Once the “Gas Analyser” menu has been accessed, you can display and edit the following items:	

- Make - Model - No. Homologation - Serial No. - Expiration date (to be edited by authorised technicians, only)	

	IMPORTANT Upon first installation, and anyway after any change to the instruments used for emissions measurement, check that the stored values match with those inside metrological logbooks, with special attention to the serial number.

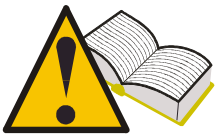
	WARNING! The parameters of this section are reported in the official report printouts!

-

8.5.2 Rev Counter Data Entry and Check

This paragraph describes how to enter non MCTC-Net (inside testers, stand alone, etc...) rev counters data.
If a MCTC-Net rev counter is connected, the information are directly read by the device.
Press ESC during the starting page.

Select the Service item and press the key (↵) to confirm.	Setup ►Service
Select the Rev Counter item and press the key (↵) to confirm.	Gas Analyser ►Rev counter …
Select the type of rev counter to be set: - Inside Gas: inside gas analyser - Stand Alone: not connected to gas analyser (revolutions will be entered by the user)	►Inside Gas Stand Alone
Here are the parameters for each one of the two rev counters: - Make - Model - No. Homologation - Serial No. - Expiration date	



WARNING!
The parameters of this section are reported in the official report printouts!

8.6 Using the Analyser for Gas Analysis

The main available functions for vehicles check are:

- Free Page, to read emissions main values as well as engine main values (temperature and rpm)
- Certified workshop check-up (blue tag for the Italian regulations) for the release of the blue tag for gasoline vehicles;
- Official Procedure, for the execution of the test according to the latest regulations for gas analyses.

To carry out any test with the gas analyser 810, at first you will have to connect the probes coming with the tester to detect engine rpm and engine oil temperature, refer to par. 5.2 if no MCTCNET network is available or to par. 5.3 if the MCTCNET testing network is available.
You can now turn the tester on using the special network switch positioned on the back side.
If the tester has not been set-up yet to operate with the supplied probes, then follow the procedure described in section 7 before continuing.

8.6.1 Operations to be carried out upon Tester Start-Up

From tester main menu, you can select the type of test you are wishing to carry out. If some peripheral unit does not respond correctly (the rev counter, for example) when the desired test is selected, you can decide whether continuing the reading using the available alternatives (for example, when the rev counter is concerned, you can use the one inside the tester or the one inside the vehicle) or interrupting the test.

8.6.2 Checks and Main Functions of the Exhaust Gas Analyser

The program automatically carries out some inspections and operations that ensure the device correct measurement function, in particular:

- warm up
- cell reset
- residual HC test
- Leak test

8.6.3 Warm Up

The cell warm up phase is useful for the thermal stabilisation of the measurement part. To continue the test wait for this phase to be completed. The warm up time depends on the starting cell conditions: the higher the starting temperature, the lower the warm up time.

8.6.4 Cell Reset

Cell reset function (or autozero) allows calibrating the CO, CO2 and HC values as well as the environmental value of O2 concentration (close to 20.90 % vol.).
Environmental air passes through an activated carbon filter and is delivered to the measuring cell. The inlet from the gas sampling probe is disabled during this phase.

8.6.5 Residual HC Check

HC testing is used to check that no residual unburned hydrocarbons are present inside the inlet circuit before carrying out a test. The HC value for cars shall be below 20 ppm vol.

8.6.6 Leak Test

The aim of the seal test is to check the gas sampling circuit sealing capacity, as the reading would be distorted by any air seepage.
No measurement reading can be carried out if the seal test is not passed with positive outcome.

IMPORTANT
The Leak test is automatically required by the instrument daily after the warm up phase and before to start the measurement procedure (Free Page)

Sampling circuit seal test is carried out by generating a vacuum inside the pneumatic circuit: a displayed message will indicate the point where the user has to kink the probe.
The analyser, thanks to the pressure sensor, detects the max. vacuum level reached.
Now pump is switched off, and analyser checks for a few seconds that the vacuum inside pipe is kept at the max. level.
If the vacuum level decreases during testing, it means that there is a leakage in the pneumatic system, and the test is failed. If carried out correctly, seal test has a daily validity.

8.7 Gas Free Page

After having been switched on, tester will directly access the main menu (shown at the side) where the operator can select the type of test to be carried out. Select the item "Free page".	<Gas analysis> ►Free page Mand.em.test Official proc.

The free page shows:
- CO value (carbon monoxide, expressed in % vol.)
- CO_2 value (carbon dioxide, expressed in % vol.)
- HC value (unburned hydrocarbons in hexane equivalent, expressed in ppm vol.)
- O_2 value (oxygen, expressed in % vol.)
- expressed in % vol.)
- factor λ value (Lambda factor, calculated based on the measured gas content)
- engine rpm (expressed in revolutions per minute)
- engine oil temperature (expressed in °C) or NO value (nitrogen oxide, expressed in ppm vol.)

From this page, press the F key to enter the following functions:
- Print of the values displayed in the free page
- Autozero, to reset the cell
- Fuel, to edit fuel type selection
- Rpm division
- HC test
- Seal test
- Selection of Temperature / NO displaying in free page

8.7.1 Autozero

Start from the free page

Press F key.	
Select the item "Autozero". Confirm with the key (↵).	Print ►Autozero Fuel …

The cell reset operation is carried out automatically.

8.7.2 Fuel Selection

This selection is important as the CO_c and factor λ values depend on the type of vehicle fuel.

Start from the free page

Press F key.	
Select the item relating to fuel selection. Confirm with the key (↵).	Print Autozero ►Fuel
Select vehicle fuel.	GASOLINE LPG ►METHANE

8.7.3 Rpm Division

This function shall be used to set the rpm multiplication or division factor according to vehicle type you are testing.

Start from the free page

Press F key.	
Select the item "Rpm division". Confirm with the key (↵).	Autozero Fuel ►Rpm division
If the rpm counter is connected, the display shows the calculated rpm using the set divisor. Press the up or down arrow keys to change the divisor. Confirm with the key (↵).	Rpm=1020 RPM Division by: 1

8.7.4 HC Test

Start from the free page

Press F key.	
Select the item relating to HC Test. Confirm with the key (↵).	Fuel Rpm division ►HC Test
The HC test is carried out automatically.	RESIDUAL HC TEST IN PROGRESS

8.7.5 Seal Test

Seal test is used to check pneumatic circuit sealing capacity.
When carrying out an official test or the Blue Tag (for the Italian regulations), the seal test is required and automatically performed upon tester first daily start-up. A seal test can be carried out at any time from the free page.
Start from the free page

Press F key.	
Select the item relating to Seal Test. Confirm with the key (↵).	Rpm division HC test ►Seal Test
Carry out the Seal Test following the indications displayed on the tester. User shall simply close the probe, and after having created a vacuum inside the pneumatic circuit the tester will turn the pump off to check that the created vacuum remains within set tolerance limits.	Seal test CLOSE PROBE

8.7.6 Oil Temperature / NO Displaying Selection

Start from the free page

Press F key.	
Select the item relating to engine oil temperature or NO displaying. The currently-displayed item is marked with an asterisk. Press ESC if you wish to keep the displayed item unchanged. Press ↵ to change the displayed item.	… HC test Seal test ►*Oil / NOx

8.7.7 Print of Gas Free Page

It is possible to print the values displayed in the free page. Start from this page.

Press F key.	
Select the item "Print" and press ↵.	►Print …

8.8 Mandatory Emission Test and Gas Official Procedure in Stand Alone Mode

8.8.1 Preliminary Steps

- Make sure that vehicle exhaust pipe is sealed, and that the emissions control system, if any, features the indispensable outfit.
- Insert the gas sampling probe in the exhaust pipe.
- Define the vehicle nominal values: type of fuel, engine temperature, rpm at idle speed, emission limits (where indicated).

8.8.2 Vehicle Engine Type Definition

To define the type of test to be carried out and the relevant limit values, you will have to select the “Engine Type” item.
To select the right item, refer to the following table

Engine Type Category	Limits and notes concerning the engine type.
<86	Test without limit values, “at best” adjustment, test at idle speed. Applicable to vehicles without OM9439-RT1902 homologation.
<86 OM9439-RT1902	CO_c value ≤ 4.5%vol. (at idle speed) Applicable to vehicles registered before 01/10/86, but homologated according to OM9439-RT1902
NO CAT – RETROFIT	CO_c value ≤ 3.5%vol. (at idle speed) Applicable to non-catalytic vehicles, or vehicles featuring a RETROFIT catalytic system and registered after 01/10/86.
CAT	COc value ≤ 0.5%vol. (at idle speed) COc value ≤ 0.3%vol.; 0.97 ≤ λ ≤ 1.03 (at accelerated idle speed) Applicable to catalytic vehicles, with Lambda sensor.
CAT. > 01-07-2002	COc value ≤ 0.3%vol. (at idle speed) COc value ≤ 0.2%vol.; 0.97 ≤ λ ≤ 1.03 (at accelerated idle speed) Applicable to catalytic vehicles with Lambda sensor and homologated according to 70/220/EEC, 98/69/CE, GU L350 limits, or registered after 01/07/2002

This selection is, obviously, very important for the test success. The Technical Manager shall carefully check the correct definition of the vehicle.

For example, in case of a catalytic vehicle registered in 2001 but homologated according to 70/220/EEC limits, you will have to select the “CAT. > 01-07-2002” category instead of the "CAT" one.

8.8.3 Test Execution

Upon analyser switching on, select the item relating to the desired function. Press the arrow keys to select the item and the key (↵) to confirm it.	Free page Mand.em.test Official proc.
After having checked the connection with instruments, analyser will require to select the type of vehicle engine (see par. 8.8.2). Based on the selection made, the type of test to be carried out and the limit values (that can nevertheless be edited) to be used are set. Press the confirmation key (↵).	<Engine Type> … ►CAT > 01-07-2002

To display and, if necessary, edit test data (emissions limits, rpm intervals at idle and accelerated idle speed, and engine oil min. temperature) select the “Edit Limits” item. Based on the selected type of vehicle, all or some of the following values can be edited: - Engine oil min. temperature - COc upper limit measured during reading at idle speed - COc upper limit measured during reading at accelerated idle speed - Factor λ lower limit during reading at accelerated idle speed - Factor λ upper limit during reading at accelerated idle speed - Engine rpm lower limit at idle speed - Engine rpm upper limit at idle speed - Engine rpm lower limit at accelerated idle speed - Engine rpm upper limit at accelerated idle speed These data shall be edited if they are specified on vehicle logbook. If not, the preset values shall be kept unchanged.	Start test ►Change limits Environment data

Select the item "Environment data" to display and change the values of environment temperature, pressure and humidity.	Start test Change limits ► Environment data
If necessary, change the environment temperature. Press the confirmation key (↵) to continue.	<123> Temperature [°C] 20
If necessary, change the environment pressure. Press the confirmation key (↵) to continue.	<123> Pressure [kPa] 101.2
If necessary, change the environment humidity. To conclude the environment data change phase, press	<123> Humidity[%]

the confirmation key (↵).	30

To start the test, select the item “Start Test” and press the confirmation key (↵).	► Start test Change limits Environment data
Select the first vehicle fuel, and press the confirmation key (↵).	►GASOLINE LPG METHANE
Select the second vehicle fuel, and press the confirmation key (↵). In case of single fuel supply, select item “---”.	►--- LPG METHANE
Select the number of vehicle exhaust pipes.	NUMBER OF EXHAUST PIPES 1
After gas cell reset and residual HC check, engine oil temperature is checked. If the measured value reaches or exceeds the set limit, the program proceeds automatically. To enter manually the oil temperature value, press the key ↵. The report printout highlights the data that have been entered manually.	Oil T = 76 °C Min. limit value: 80 °C
To check that all values are correct, the main values necessary for test execution and the main set parameters (vehicle category, fuels and number of exhaust pipes) are displayed. If you press the F function key, you can reset cell again, edit rpm divider, carry out a residual HC test, and a seal test. To start the measurement phase, press the key ↵.	COc=0.15 % λ=1.022 RPM= 1020 CAT > 01-07-2002 1. GASOLINE 2. --- Number of exhaust pipes 1 ↵ Test Start
Follow the displayed instructions.	INSERT PROBE INSIDE EXHAUST PIPE
Once probe has been inserted, the following steps will be displayed. Bring the engine rpm to the indicated range and wait for the gas stabilisation. If the "Blue Tag" is selected, you can force values acquisition by pressing key ↵.	
Once test is finished, if engine rpm value has not been correctly detected, you will be required to manually enter the measured values as an alternative.	
The test result is displayed at the end of it.	RESULT AT IDLE SPEED: R

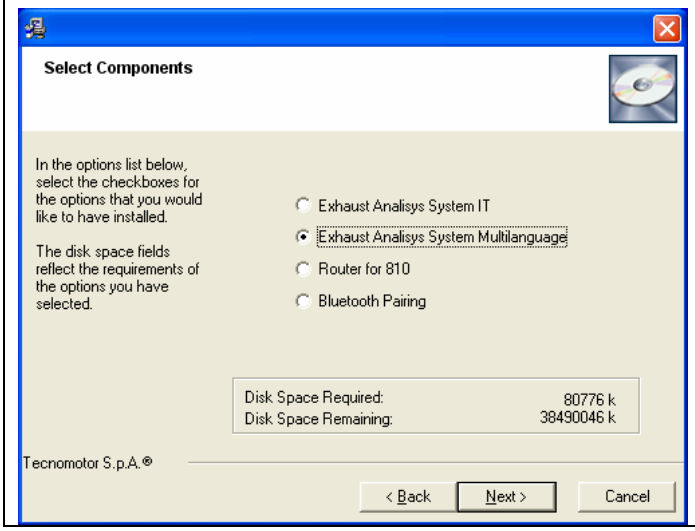
Press the key ↵ to go on.	COc=0.1 % < 0.3 % RESULT AT MIN ACC: R COc=0.1 % < 0.2 % λ=1.002 0.97-1.03
Now you can repeat the reading, force test outcome, issue a report printout, and go back to main menu.	REPEAT TEST CHANGE RESULT PRINT ►END

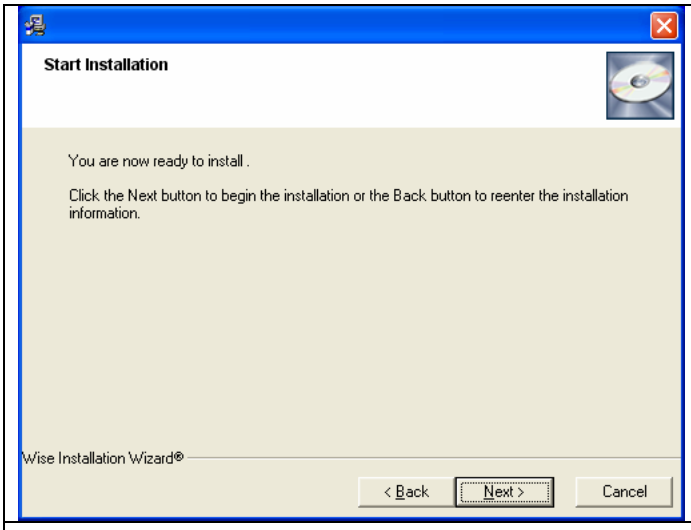
8.8.4 Report Printout

Select the "Print" item and confirm it with the key ↵.	REPEAT TEST CHANGE RESULT ►PRINT END
Enter the vehicle data: make, model, number plate, frame number, mileage, year of first registration. Check the name of the Technical Manager who carried out the test, and change it, if necessary.	

9 Software Exhaust analysis system

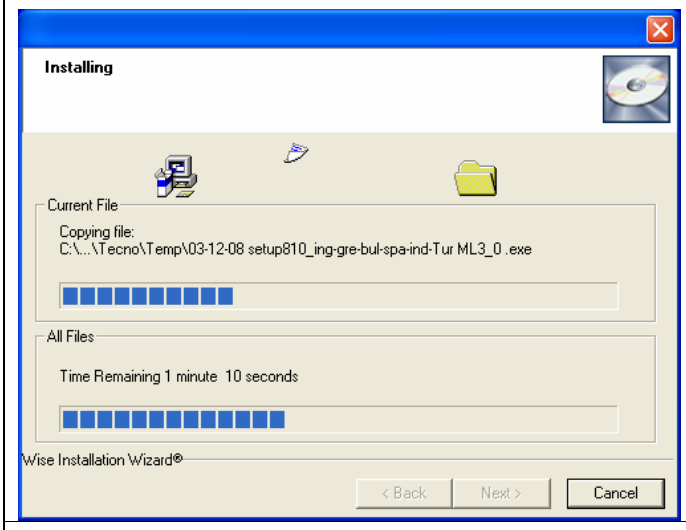
9.1 Installation

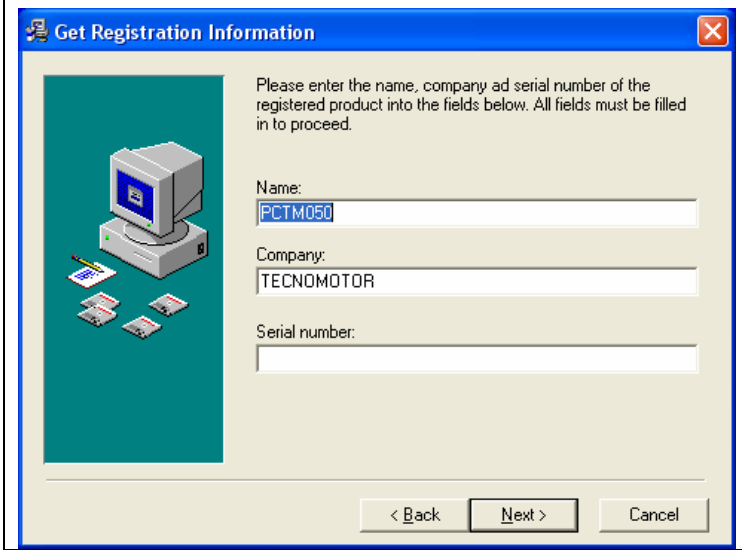
	Insert The cd of Exhaust Analysis System in the CD Drive.
	The installation start in automatic mode
	Select Exhaust Analysis System Multilanguage (the second option)


Start Installation
You are now ready to install.
Click the Next button to begin the installation or the Back button to reenter the installation information.
Wise Installation Wizard®
< Back
Next >
Cancel

You are now ready to install.

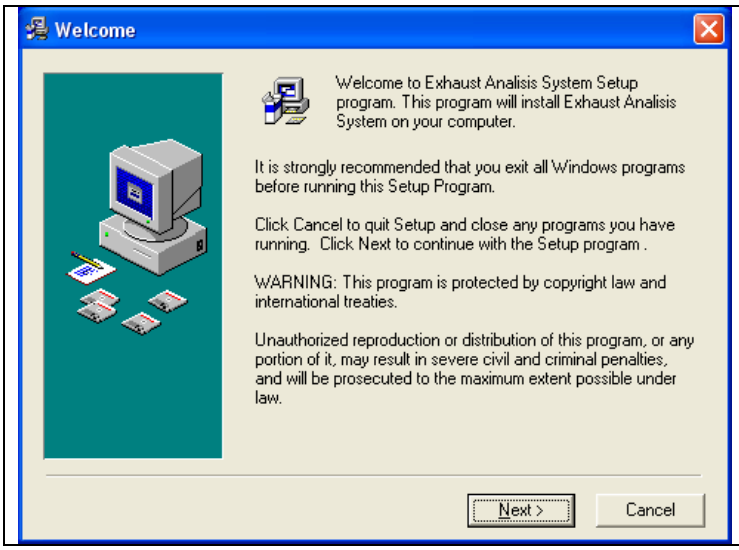
Press next to start.




Get Registration Information
Please enter the name, company ad serial number of the registered product into the fields below. All fields must be filled in to proceed.
Name:
PCTM050
Company:
TECNOMOTOR
Serial number:
< Back
Next >
Cancel

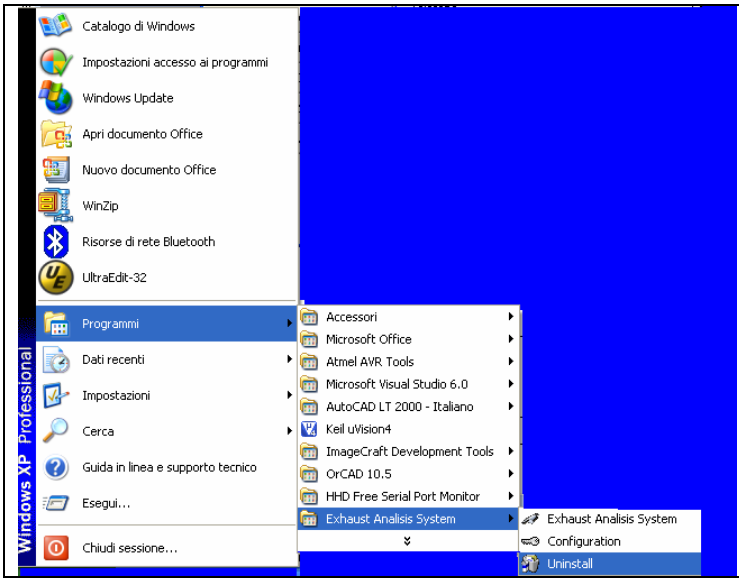
Insert the key when required it.

The intstallation key is: “**5123-TME-0174**”


Welcome
Welcome to Exhaust Analisis System Setup program. This program will install Exhaust Analisis System on your computer.
It is strongly recommended that you exit all Windows programs before running this Setup Program.
Click Cancel to quit Setup and close any programs you have running. Click Next to continue with the Setup program .
WARNING: This program is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.
Next >
Cancel

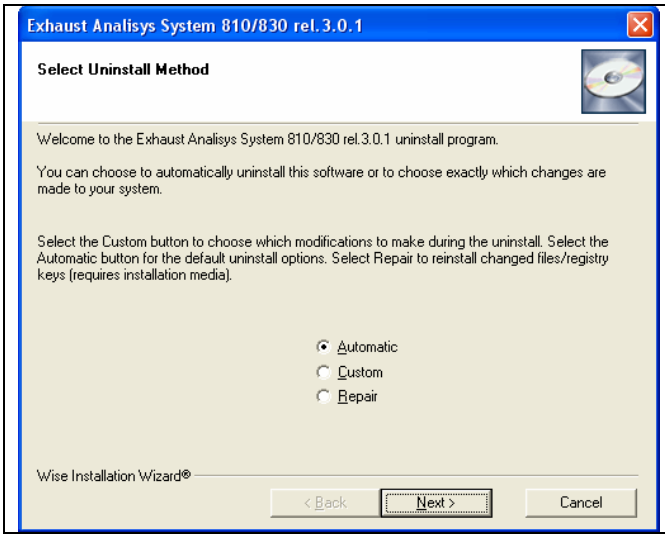
Select the next Button and wait that the installation is finished.

9.2 Uninstall Exhaust Analysis System



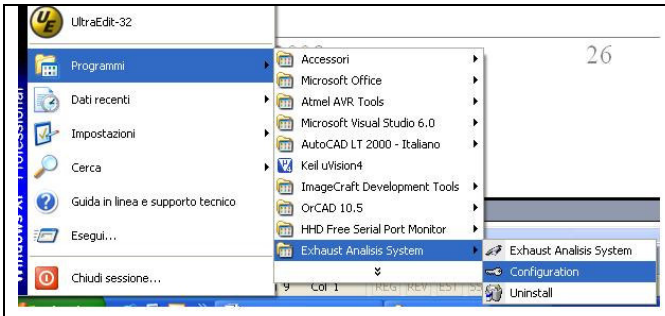
If you want uninstall the exhaust Analysis System select

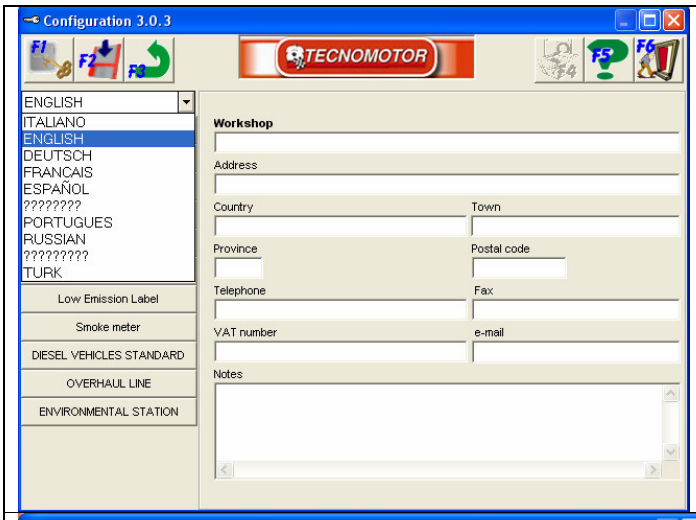
Start->Programs->Exhaust Analysis System->Uninstall

	Select the uninstall Method: Automatic mode is **recommended** Press Next and wait the end of the uninstall process**.**

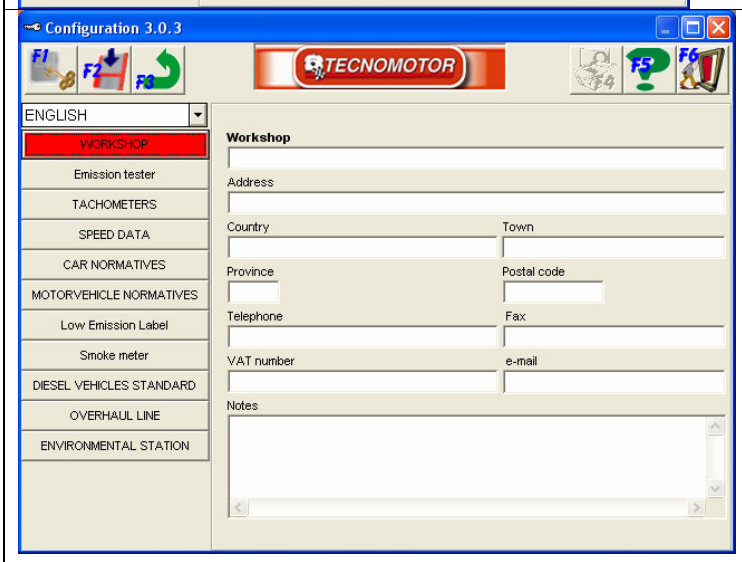
9.3 Configuration

Only at the first use you must enter in this configuration module software.

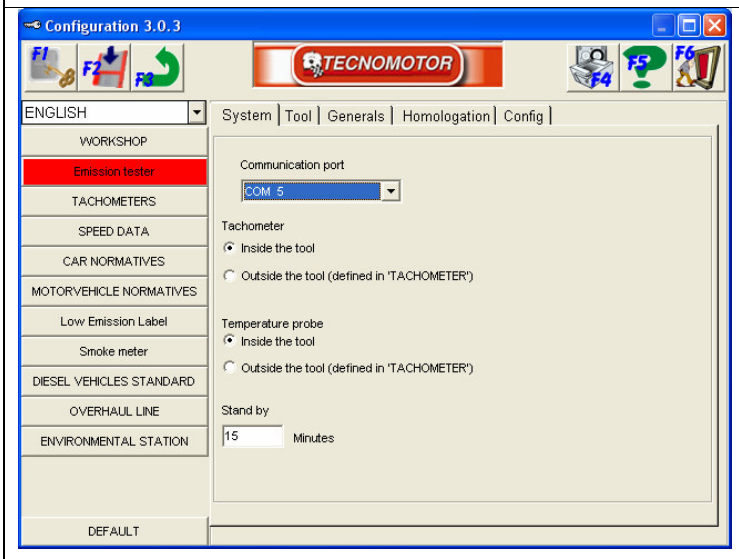
	Select on the PC Start-> Exhaust Analysis system->configuration and open this software.
	Press “F1” key on the keyboard and insert the password “**CENTROAT**”



NOW you can Change the language of the software



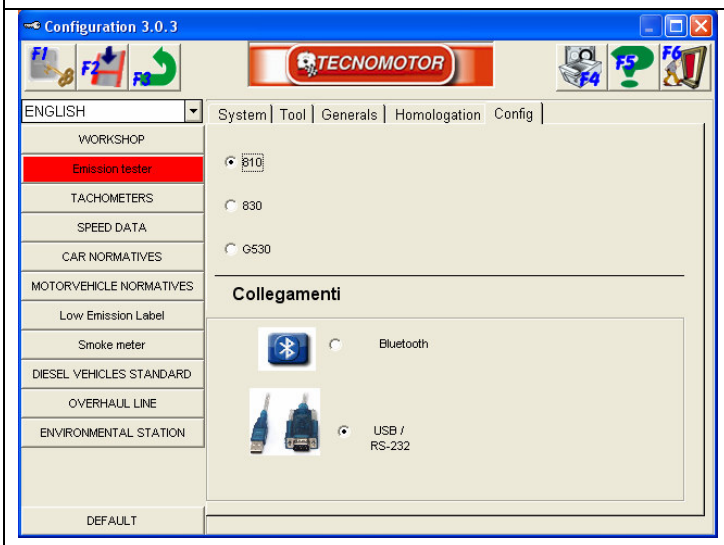
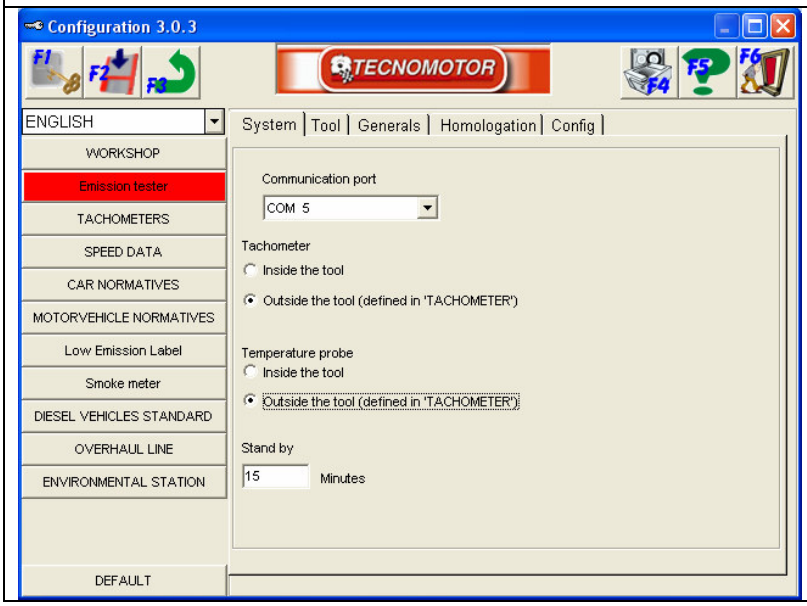
Select WORKSHOP secondary menu and put the data of the WORKSHOP in the relative box.

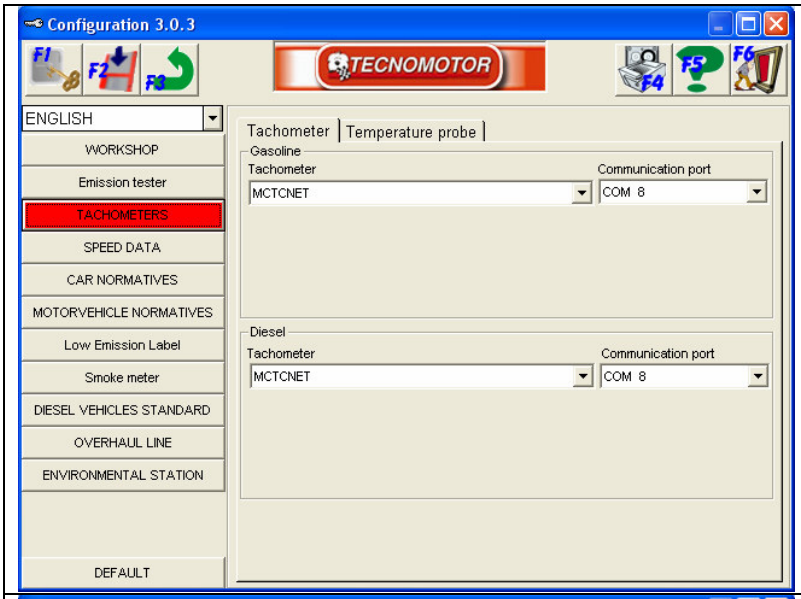


In the secondary menu EMISSION TESTER you can change the configuration of the gas Analyzer.

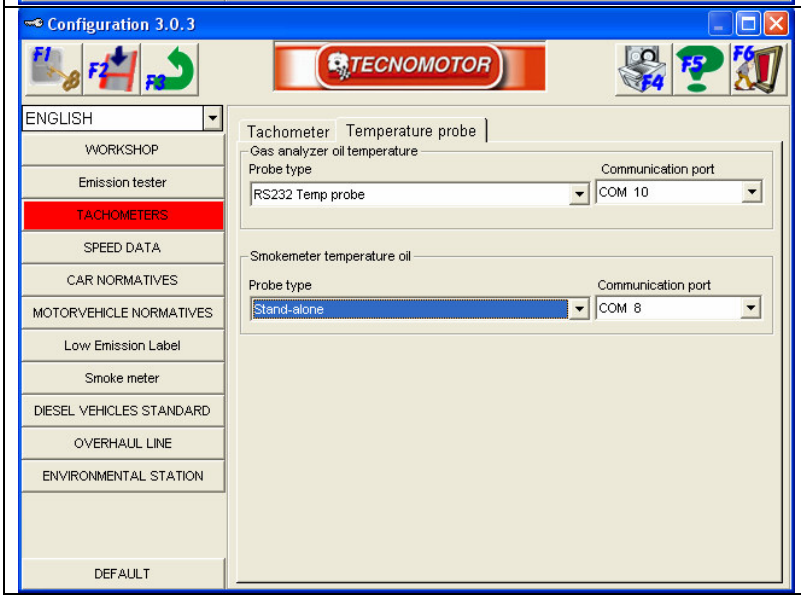
Select the correct port Comunication of the gas analyzer and if you have the inductive Tachometer select the option “INSIDE THE TOOL”

if you have the

	temperature PROBE select the option “INSIDE THE TOOL”
	In the secondary menu EMISSION TESTER->CONFIG Select the correct Model of the gas analyzer and the type of counication : Bluetooth or rs232.
	If you have got a Serial Tachometer (PFM941) OR/AND a serial Temperature Probe you must connect the devices at the port com of the PC. In this case you must select “outside the tool”.



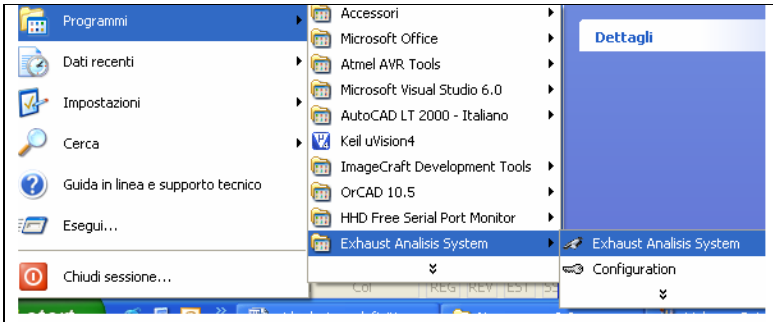
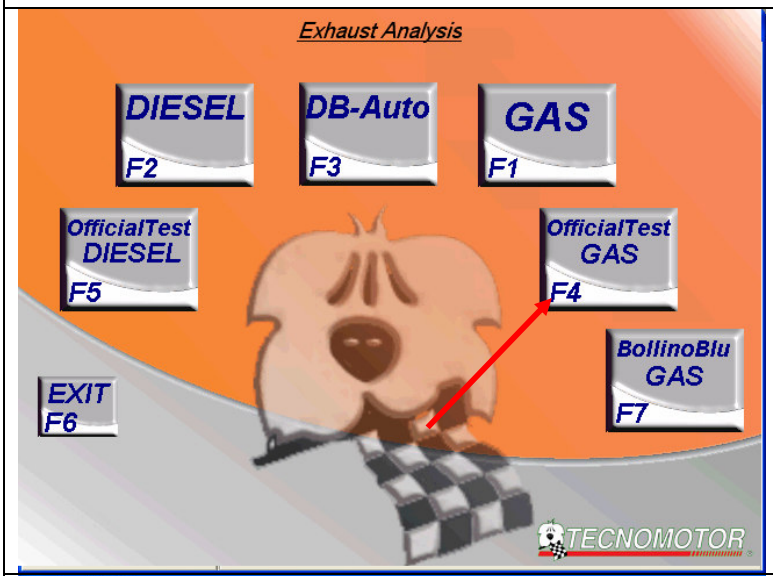
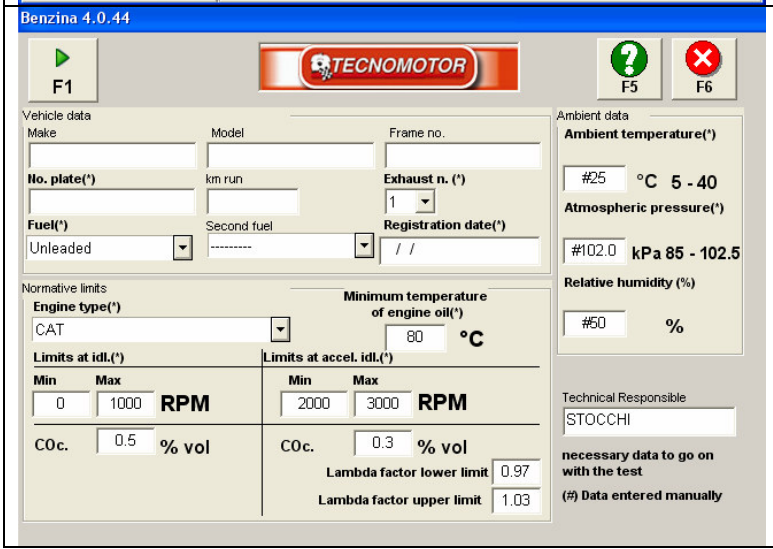
Select the correct port for the serial Tachometer and the MCTCNET type.

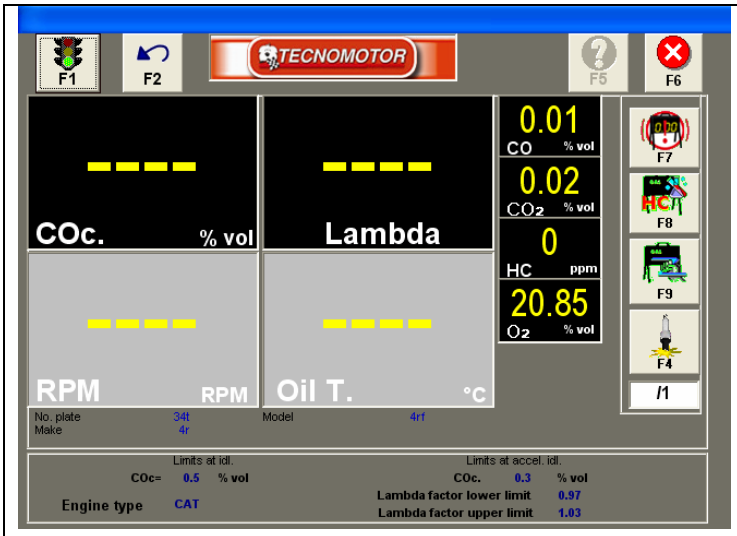


If you have a rs232 Tecnomotor Temperature Probe:

select the rs232 gas Analyzer Temperature Probe for the Gas Analyzer and the correct port com for the comunication with the probe.

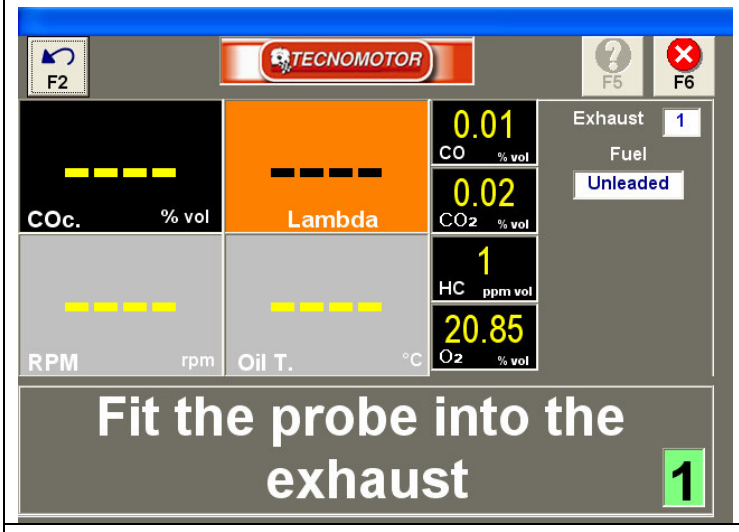
9.4 Official Test

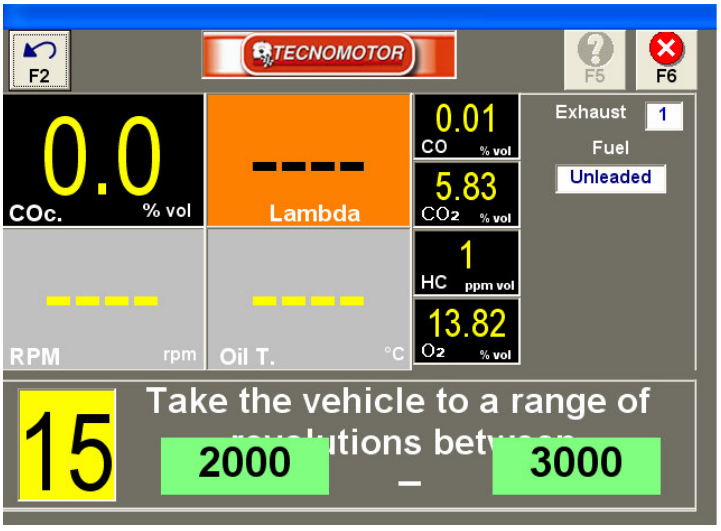
	Select Programmi->Exhaust Analysis System->Exhaust Analysis System
	Select Official Test Gas Or press F4 Key with the keyboard.
	Insert vehicle data for the final test report and press F1 KEY on the keyboard.

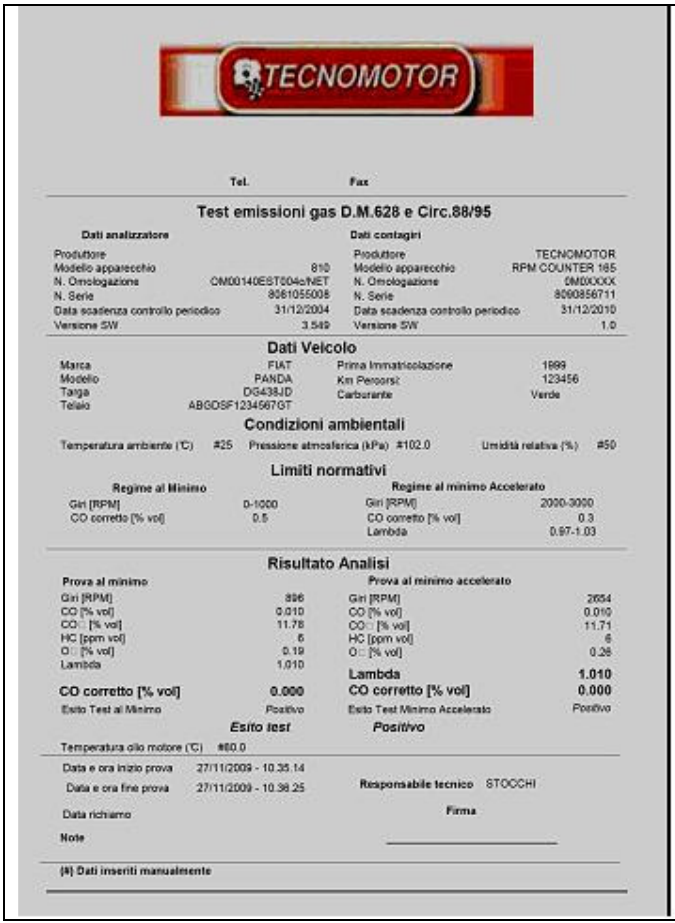


Now you are ready to start a new test. Fit the probe into the exhaust and the value of the gas data will change.

When all the values of the gas be stabilized ,you press F1 key.







TECNOMOTOR

Tel. Fax

Test emissioni gas D.M.628 e Circ.88/95

Dati analizzatore		Dati contagiri	
Produttore		Produttore	TECNOMOTOR
Modello apparecchio	810	Modello apparecchio	RPM COUNTER 165
N. Omologazione	OM00140EST004c/NET	N. Omologazione	0M0XXXX
N. Serie	8061055008	N. Serie	8060856711
Data scadenza controllo periodico	31/12/2004	Data scadenza controllo periodico	31/12/2010
Versione SW	3.549	Versione SW	1.0

Dati Veicolo

Marca	FIAT	Prima Immatricolazione	1999
Modello	PANDA	Km Percorsi	123456
Targa	DG438JD	Carburante	Verde
Telaio	ABGDSF1234567GT		

Condizioni ambientali

Temperatura ambiente (°C) #25 Pressione atmosferica (kPa) #102.0 Umidità relativa (%) #50

Limiti normativi

Regime al Minimo		Regime al minimo Accelerato	
Giri [RPM]	0-1000	Giri [RPM]	2000-3000
CO corretto [% vol]	0.5	CO corretto [% vol]	0.3
		Lambda	0.97-1.03

Risultato Analisi

Prova al minimo		Prova al minimo accelerato	
Giri [RPM]	896	Giri [RPM]	2654
CO [% vol]	0.010	CO [% vol]	0.010
CO□ [% vol]	11.78	CO□ [% vol]	11.71
HC [ppm vol]	6	HC [ppm vol]	6
O□ [% vol]	0.19	O□ [% vol]	0.28
Lambda	1.010	Lambda	1.010
CO corretto [% vol]	**0.000**	**CO corretto [% vol]**	**0.000**
Esito Test al Minimo	Positivo	Esito Test Minimo Accelerato	Positivo
	Esito test	***Positivo***	

Temperatura olio motore (°C) #80.0

Data e ora inizio prova 27/11/2009 - 10.35.14

Data e ora fine prova 27/11/2009 - 10.36.25 Responsabile tecnico STOCCHI

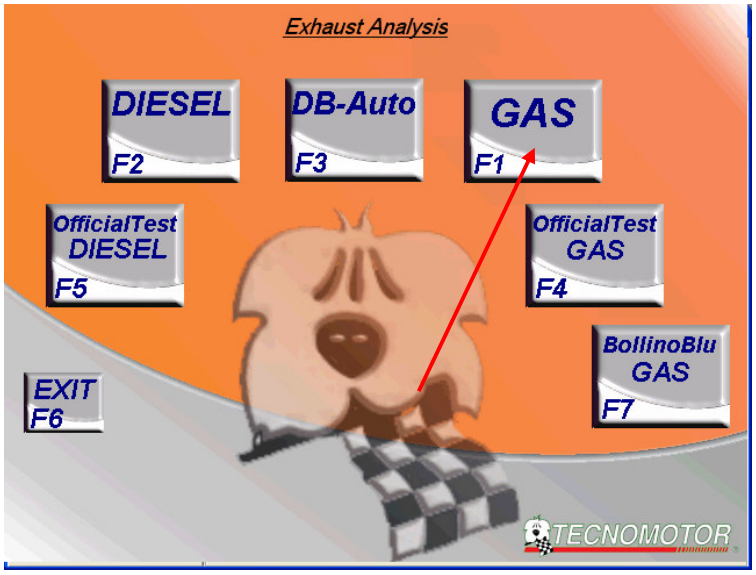
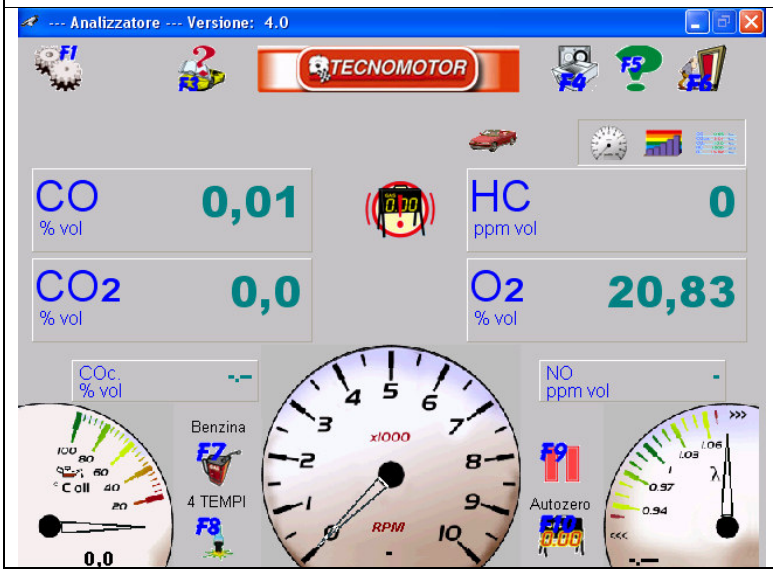
Data richiamo Firma

Note

(#) Dati inseriti manualmente

When the official test is finished you can print a Report.

9.5 Free page

	From the main Menu press F1 key on the keyboard
	Free page mode is only a page of misure of the typical gas

10 Lambda Equations used in the Gas Analyzer

The lambda equation used into the software PC, and into the firmware of the gas Analyzer 810 is the Equation in fig. 10.1 .

$$\lambda = \frac{21 \times \left[[CO2] + \frac{[CO]}{2} + [O2] + \left(Hcv / 4 \times \frac{3.5}{3.5 + [CO]/[CO2]} \times 0.00877 \right) \times ([CO2] + [CO]) \right]}{\left[21 + 0.5628 \times \frac{[CO]/[CO2]}{3.5 + [CO]/[CO2]} \right] \times \left[1 + (Hcv / 4) - 0.01754 / 2 \right] \times [[CO2] + [CO] + [HC] \times 6 \times 10 - 4]}$$